

What is claimed is:

1. 1. A computer program product for serializing data structure retrievals and updates, the  
2 computer program product embodied on one or more computer-readable media and comprising:  
3 computer-readable program code means for creating two identical tree structures, each  
4 representing an initial state for accessing stored data;  
5 computer-readable program code means for performing searches against a first of the two  
6 trees;  
7 computer-readable program code means for performing a first update against a second of  
the two trees, yielding a revised tree;  
8 computer-readable program code means for switching the first tree and the revised tree,  
such that the first tree becomes the second tree and the revised tree becomes the first tree;  
9 computer-readable program code means for performing, after operation of the computer-  
10 readable program code means for switching, a second update against the second tree, yielding a  
11 synchronized tree that is structurally identical to the first tree; and  
12 computer-readable program code means for performing subsequent searches against the  
13 first tree.
  
1. 2. The computer program product according to Claim 1, further comprising:  
2 computer-readable program code means for obtaining an exclusive lock prior to operation  
3 of the computer-readable program code means for performing the first update; and  
4 computer-readable program code means for releasing the exclusive lock after operation of  
5 the computer-readable program code means for performing the second update and the computer-

6 readable program code means for switching.

1       3. The computer program product according to Claim 1, wherein atomic transactions are  
2 used to maintain proper synchronization between the first tree and the second tree.

1       4. The computer program product according to Claim 1, wherein the computer-readable  
2 program code means for performing the first update further comprises computer-readable  
3 program code means for queuing a transaction, and wherein the computer-readable program code  
4 means for performing the second update further comprises computer-readable program code  
5 means for applying the queued transaction against the second tree that results from operation of  
6 the computer-readable program code means for switching.

1       5. The computer program product according to Claim 1, further comprising computer-  
2 readable program code means for performing a subsequent update against the synchronized tree  
3 that results from operation of the computer-readable program code means for performing the  
4 second update; and wherein operation of the computer-readable program code means for  
5 performing the subsequent update causes another operation of the computer-readable program  
6 code means for switching.

1       6. A system for serializing data structure retrievals and updates in a computing environment,  
2 comprising:  
3           means for creating two identical tree structures, each representing an initial state for

4       accessing stored data;  
5           means for performing searches against a first of the two trees;  
6           means for performing a first update against a second of the two trees, yielding a revised  
7       tree;  
8           means for switching the first tree and the revised tree, such that the first tree becomes the  
9       second tree and the revised tree becomes the first tree;  
10          means for performing, after operation of the means for switching, a second update against  
the second tree, yielding a synchronized tree that is structurally identical to the first tree; and  
12          means for performing subsequent searches against the first tree.

7.       The system according to Claim 6, further comprising:  
means for obtaining an exclusive lock prior to operation of the means for performing the  
first update; and  
means for releasing the exclusive lock after operation of the means for performing the  
second update and the means for switching.

1       8.       The system according to Claim 6, wherein atomic transactions are used to maintain proper  
2       synchronization between the first tree and the second tree.

1       9.       The system according to Claim 6, wherein the means for performing the first update  
2       further comprises means for queuing a transaction, and wherein the means for performing the  
3       second update further comprises means for applying the queued transaction against the second

4 tree that results from operation of the means for switching.

1 10. The system according to Claim 6, further comprising means for performing a subsequent  
2 update against the synchronized tree that results from operation of the means for performing the  
3 second update; and wherein operation of the means for performing the subsequent update causes  
4 another operation of the means for switching.

5  
6 11. A method for serializing data structure retrievals and updates in a computing environment,  
7 comprising step of:

8 creating two identical tree structures, each representing an initial state for accessing stored  
9 data;

10 performing searches against a first of the two trees;

11 performing a first update against a second of the two trees, yielding a revised tree;

12 switching the first tree and the revised tree, such that the first tree becomes the second  
13 tree and the revised tree becomes the first tree;

14 performing, after the switching step, a second update against the second tree, yielding a  
15 synchronized tree that is structurally identical to the first tree; and

16 performing subsequent searches against the first tree.

17 12. The method according to Claim 11, further comprising steps of:

18 obtaining an exclusive lock prior to performing the first update; and

19 releasing the exclusive lock after performing the second update and the switching.

- 1       13. The method according to Claim 11, wherein atomic transactions are used to maintain  
2 proper synchronization between the first tree and the second tree.
- 1       14. The method according to Claim 11, wherein the step of performing the first update further  
2 comprises queuing a transaction, and wherein the step of performing the second update further  
3 comprises applying the queued transaction against the second tree that results from operation of  
the switching step.
- 1       15. The method according to Claim 11, further comprising the step of performing a  
2 subsequent update against the synchronized tree that results from performing the second update;  
and wherein the step of performing the subsequent update causes repeating the switching step.
- 1       16. A method of serializing access to data structures in a computing system, comprising steps  
2 of:  
3            maintaining two trees, a first of which is used for one or more concurrent searches and a  
4 second of which is used for an update operation;  
5            switching the two trees after performing the update operation; and  
6            synchronizing the two trees such that both reflect the update operation.
- 1       17. A method of serializing access to data structures in a computing system, comprising steps  
2 of:

3                   maintaining two data structures, a first of which is used for one or more concurrent  
4                   searches and a second of which is used for an update operation;  
5                   switching the two data structures after performing the update operation; and  
6                   synchronizing the two data structures such that both reflect the update operation.

1       18.     The method of Claim 17, wherein the two data structures are B-trees.

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